The Total Resource Cost of Saved Energy for Utility Customer-Funded Energy Efficiency Programs

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Overview

- Why study the cost of saving energy through efficiency programs?
- LBNL DSM Program Database and the Total Resource Cost of Saved Energy
- Data Issues: TRC and Participant Costs
- Results
  - National
  - Sectoral
  - Program
  - State
- Summary

LBNL Cost of Saved Energy Project

The cost of saved energy (CSE) has not been comprehensively documented or analyzed at the program level

Approach

- Collected & analyzed reported annual EE program data in 34 states

Objectives

- Enable policymakers and program administrators to compare and weigh resource options
- Encourage more consistent reporting of EE program impacts and costs
- Enable assessment of program approaches and performance across different markets, delivery mechanisms and designs

Uses for Regulators

- More informed choices among demand and supply resources
- Better understanding of the costs of efficiency
- Keener insight and input into DSM investments

Data Collection and Standardization

LBNL DSM Program Database

- **Program Administrator (PA) CSE: 100+ administrators in 34 states**
  - **5,900 program years for 2009-2013**
- **Total Resource CSE: 50 administrators in 19 states**
  - **2,100 program years for 2009-2013**
- **Internal QA/QC process for data integrity**

Types of Data Collected

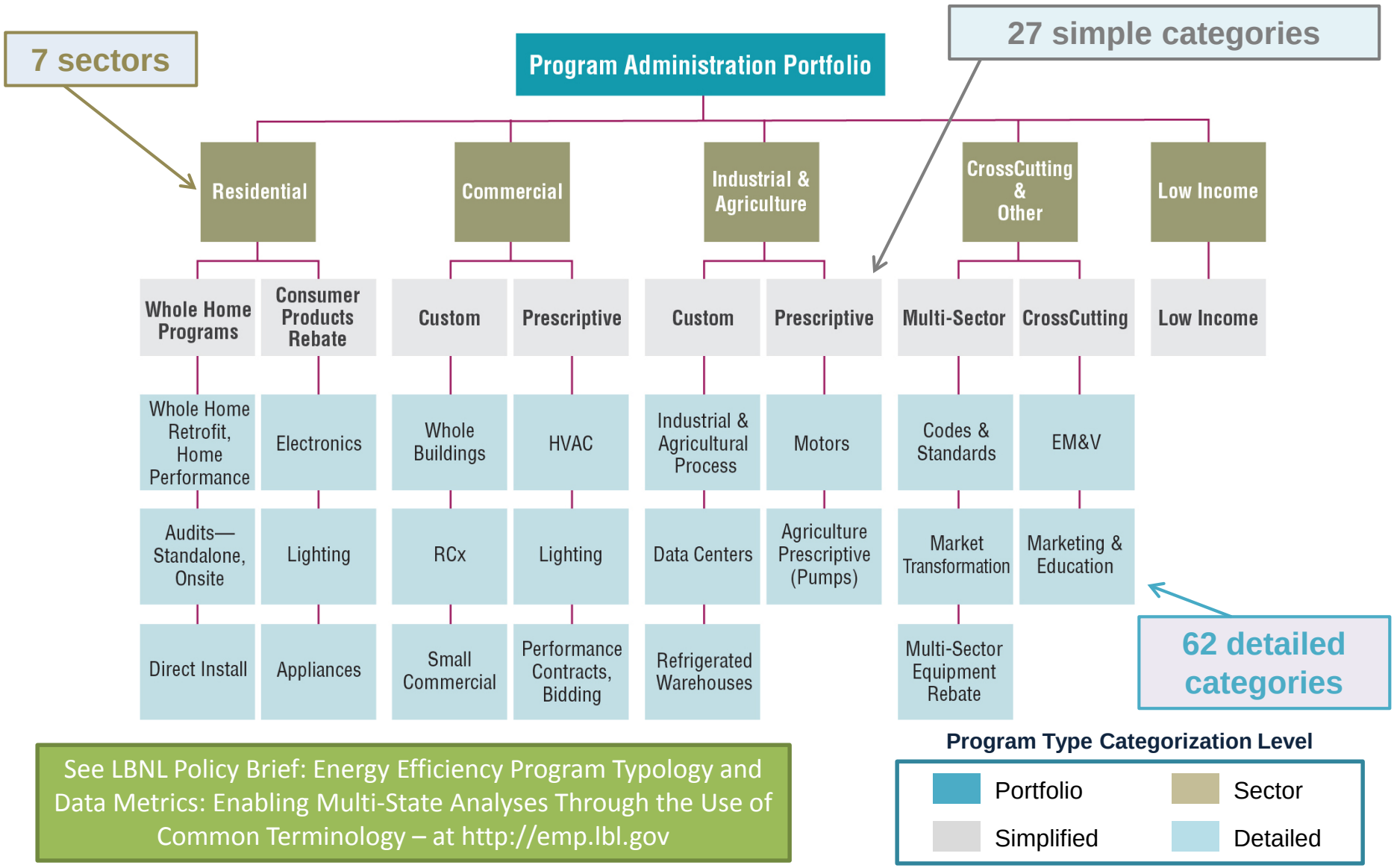
- Net & **gross savings**
- **Annual incremental** & lifetime savings
- Budgets & **expenditures**
  - Administrative costs
  - Incentive costs
  - Education, marketing & outreach
  - Evaluation
- **Participant costs**
- Measure **lifetimes for programs**
- Number of program participants

Standardization Is Critical to Aggregating Data and Comparing Cost Performance

- **Developed a common DSM lexicon**
  - Standard **terms and definitions** for program data and metrics
  - A national **typology of programs**

➢ **Encourage more consistent reporting by program administrators**

LBNL Efficiency Program Typology



See LBNL Policy Brief: Energy Efficiency Program Typology and Data Metrics: Enabling Multi-State Analyses Through the Use of Common Terminology – at http://emp.lbl.gov

Program Type Categorization Level

Portfolio	Sector
Simplified	Detailed

Defining the Levelized Total Resource CSE

$$Levelized\,Total\,Resource\,Cost\,of\,Saved\,Energy^{*} =$$

$$\frac{Capital\,Recovery\,Factor * (Total\,Program\,Administrator\,Costs + Participant\,Costs\,(net\,of\,incentives))}{Annual\,Energy\,Savings\,(in\,kWh)}$$

Where the $Capital\ Recovery\ Factor$ = $[A * (1 + A)\text{^}B]/[(1 + A)\text{^}B - 1]$
A = Discount rate (LBNL uses 6% real as a proxy for an electric utility WACC)
B = Years of program savings, calculated as the savings-weighted life of the efficiency actions in aggregate

Critical value: Net Participant Costs (in constant 2012 dollars)

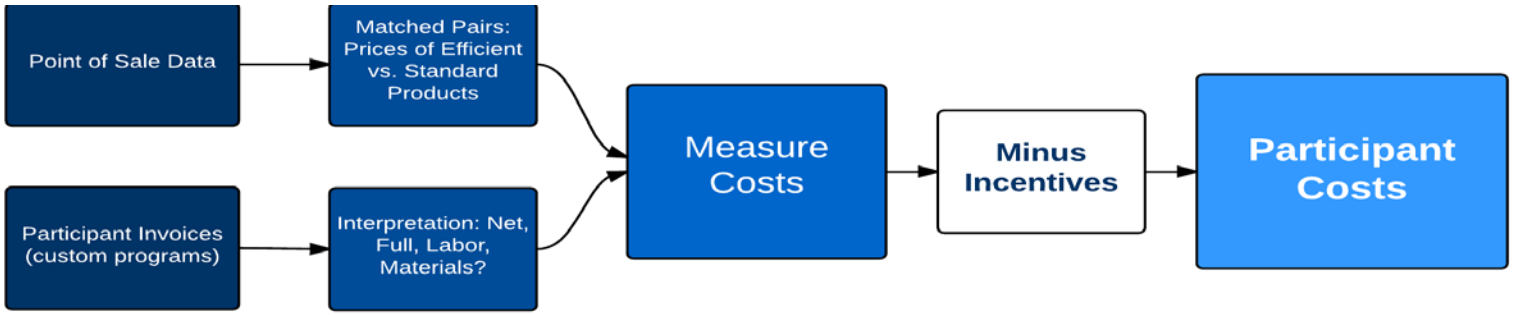
**The levelized total resource cost of saved energy is not the TRC cost-effectiveness screening test.*

Data and Definition Issues: Participant Costs

Two Primary Challenges

1) Program administrators define and calculate the participant portion of total resource costs differently
   - Some leave out all incentives
   - Some leave out end-user rebates
- We fix these inconsistencies in data collection.

2) More fundamentally, participant costs are derived most commonly from a) measure costs or b) participant invoices. Both pose difficulties.
   - Raw price data often hard to interpret and translate into generalized measures
   - Ex ante values **rarely updated** and often borrowed, sometimes with **no adjustment for different markets, delivery channels or time**

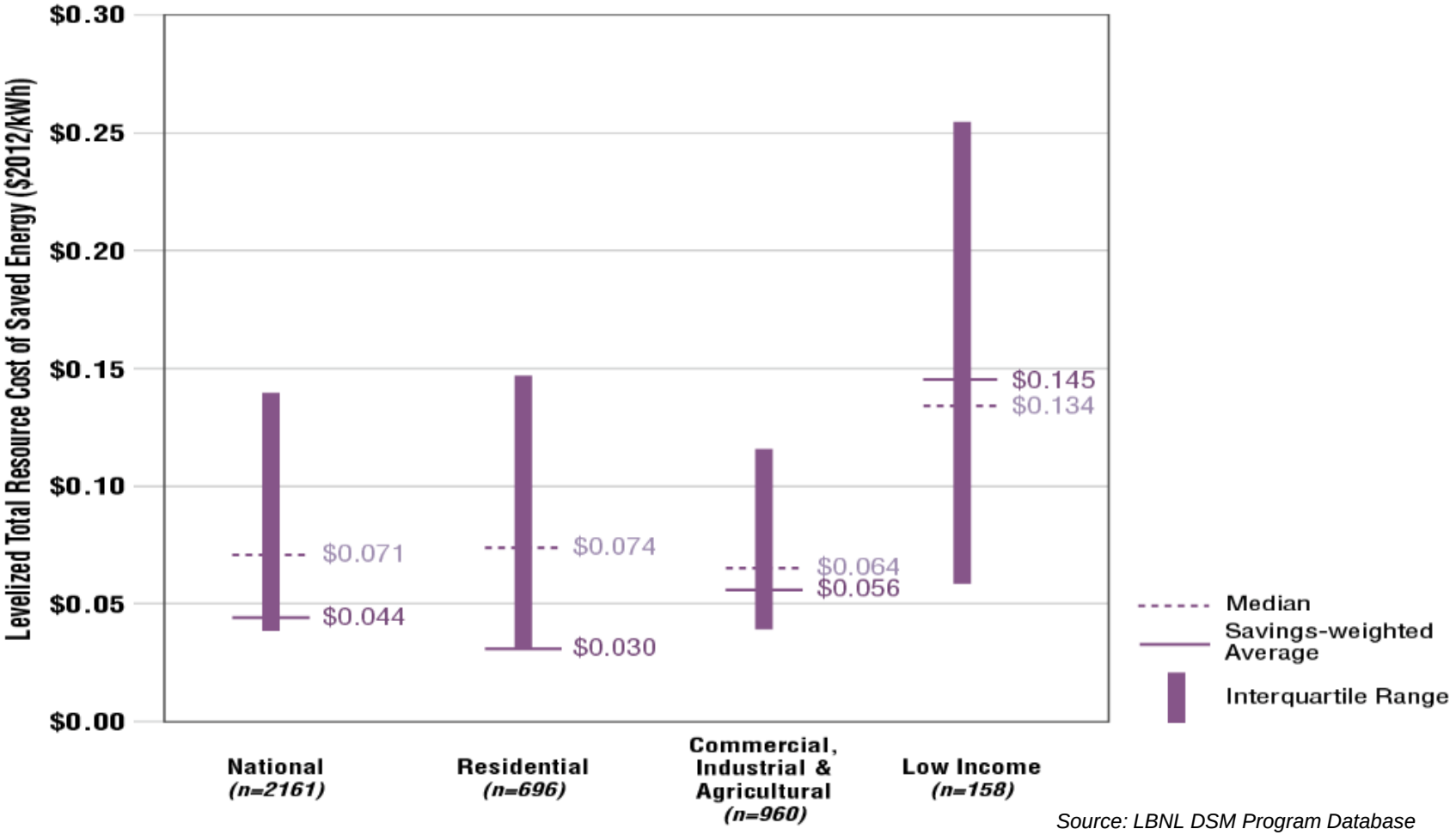


Metrics used in the results

- Focus on **total resource costs**:
  - at national and state levels
  - by market sector (e.g., C&I, residential)
  - by program type (e.g., residential whole house programs, commercial retro-commissioning, and industrial custom programs)
- CSE values are calculated in two ways:
  - **Savings-weighted average CSE**: Calculated using all savings and expenditures at the level of analysis: national, sector, program category
  - **Program-specific medians** and **inter-quartile ranges**:
    - Based on calculations for each individual program type
    - Gives equal weighting to all programs irrespective of their relative size (either in terms of savings or costs)

National TRC CSE Results

- U.S. savings-weighted average levelized total resource CSE is **$0.044/kWh**
- **Residential programs** had the lowest savings-weighted total resource CSE **($0.03/kWh)** followed by **C&I programs ($0.056/kWh)**

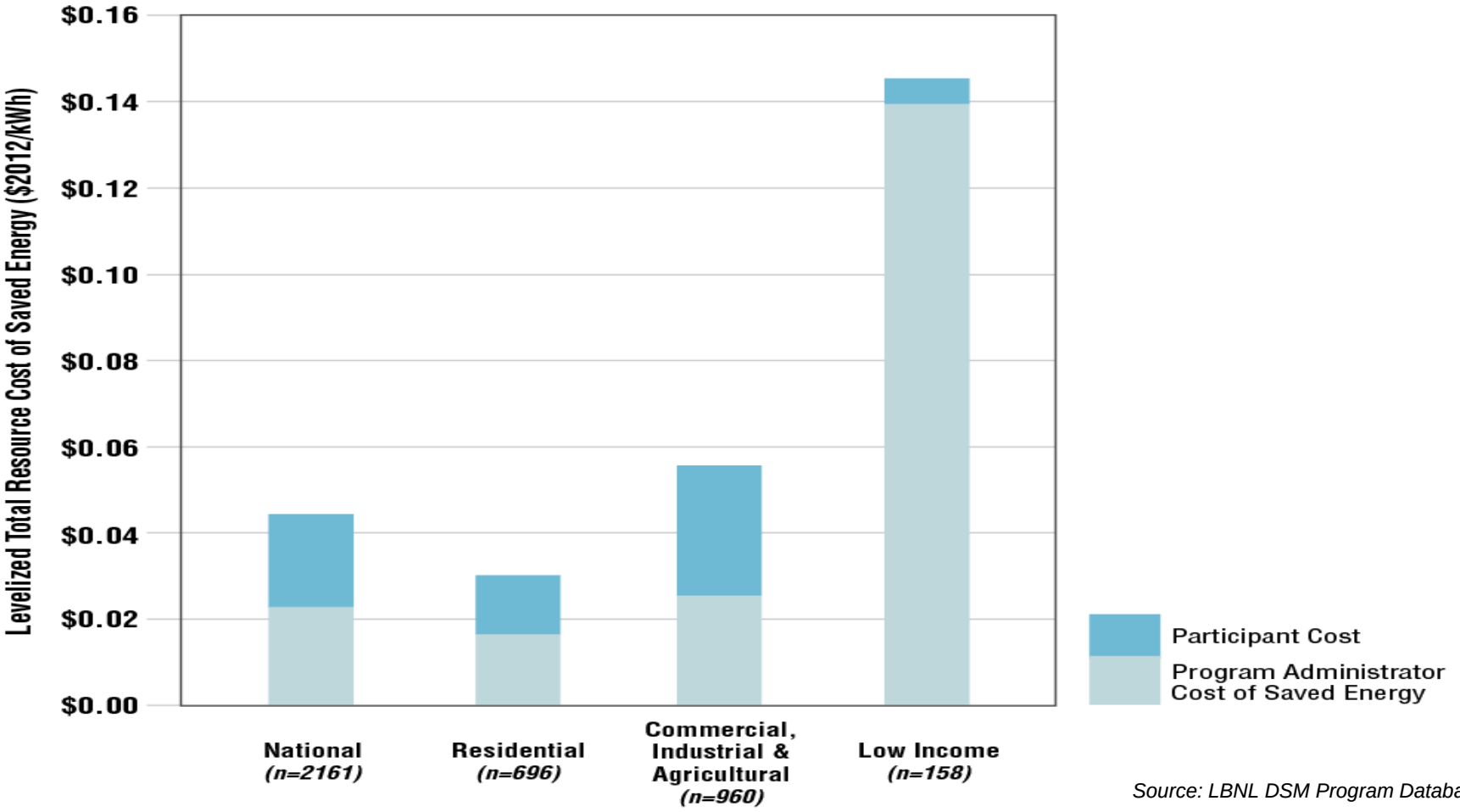


Source: LBNL DSM Program Database

Values in this figure are based on the 2009-2013 data in the LBNL DSM Program Impacts Database. CSE values are for program administrator costs are based on gross savings. Savings are levelized at a 6% real discount rate. The savings-weighted average CSE is calculated using all savings and expenditures at the level of analysis. The inter-quartile range and median CSE values are calculated for each program type.

National TR vs PA Cost of Saved Energy

- Savings-weighted average **TR CSE ($0.044/kWh) was nearly twice the PA CSE ($0.023/kWh),** so every $1 spent by PAs drew $0.95 from participants
- Suggests that PA spending of **$6B in 2012** drove an industry of **$12.2B**



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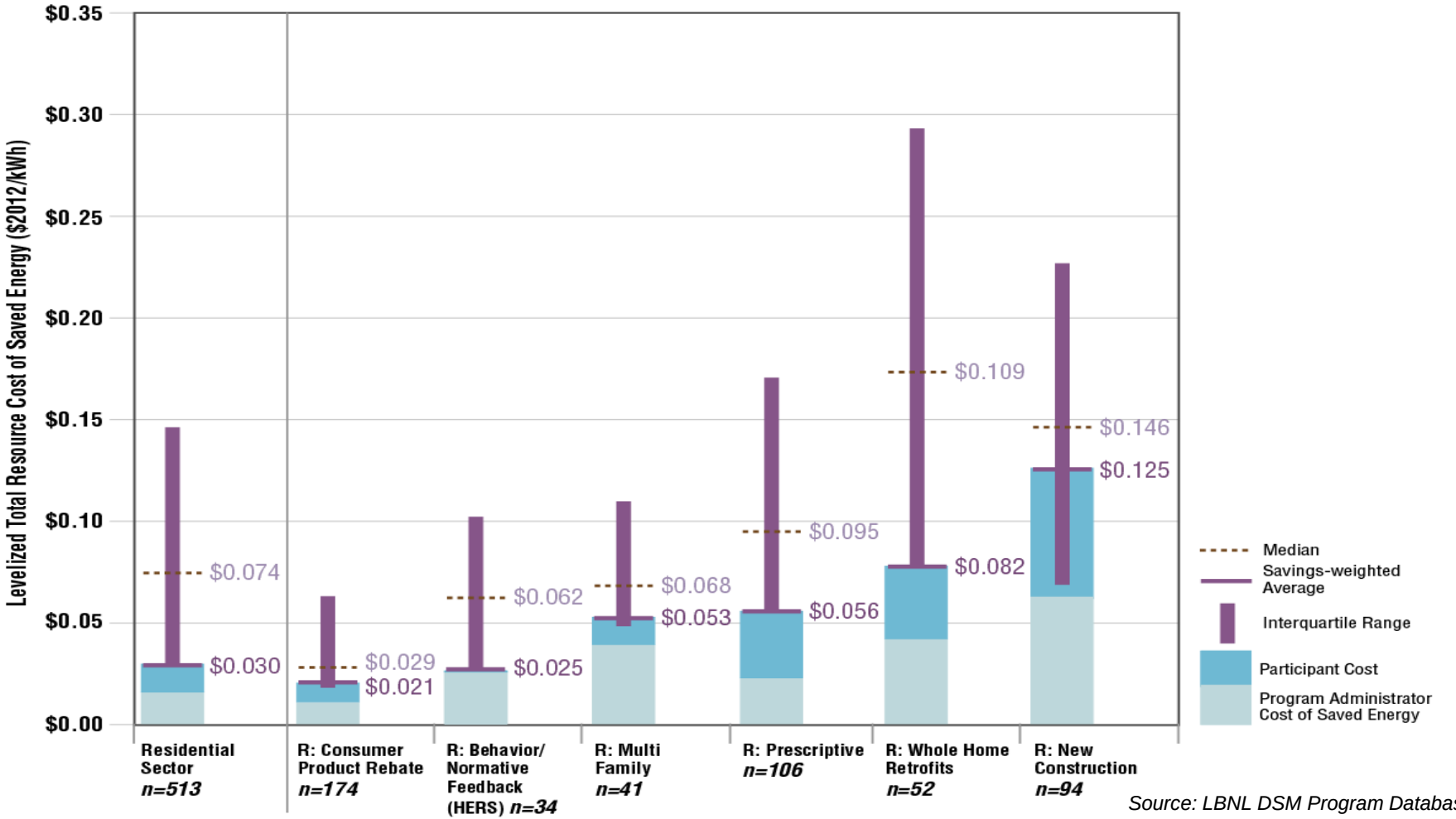
Residential TR CSE for Electricity Efficiency Programs

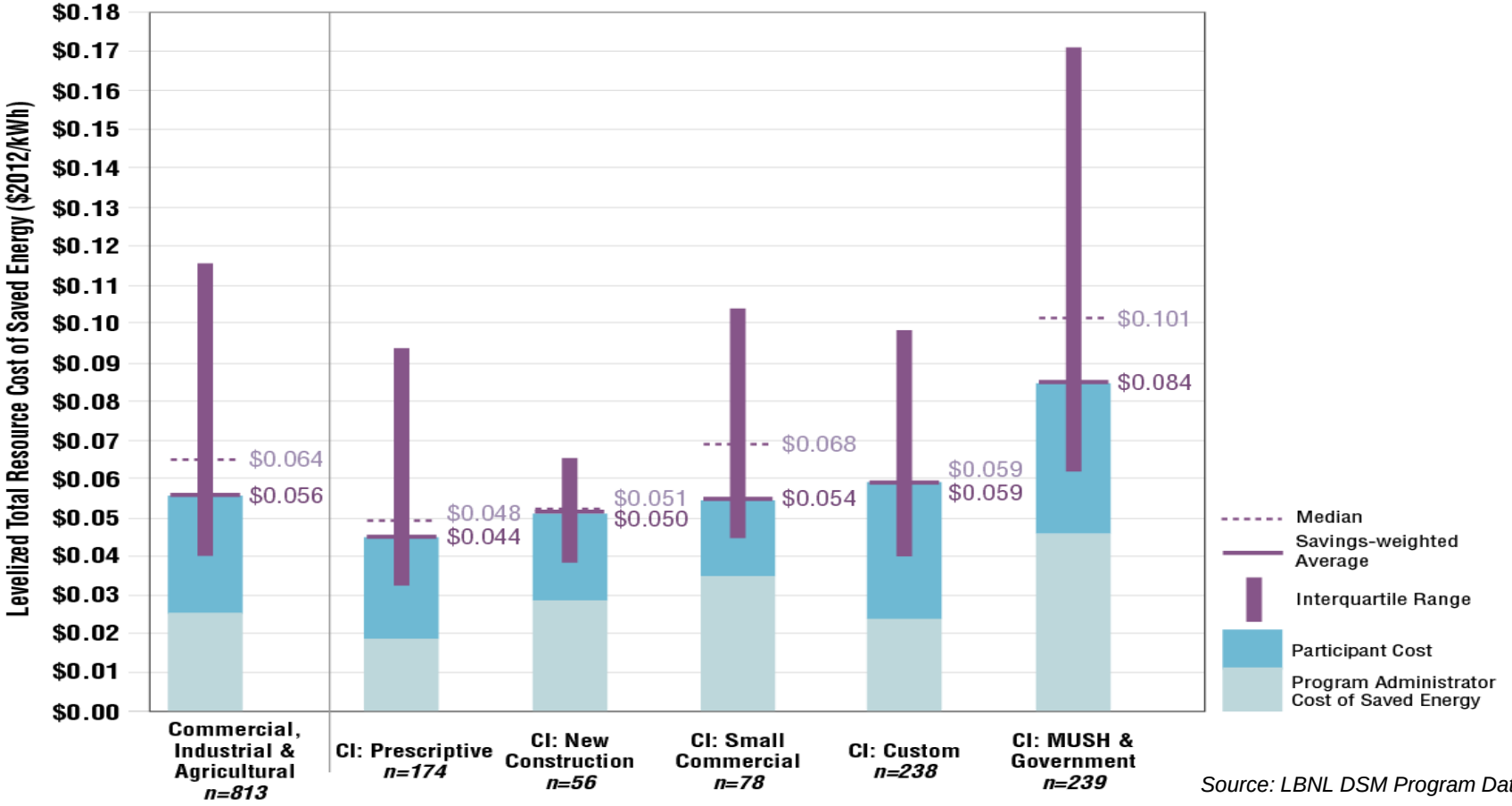
- Low residential TR CSE driven by **lighting programs (**60% of sector savings at **$0.018/kWh)**
- Normative **behavioral programs** were **$0.025/kWh**
- Other residential programs – especially **multi-measure –** were **$0.06-$0.13/kWh**



Source: LBNL DSM Program Database

C&I TR CSE for Electricity Efficiency Programs

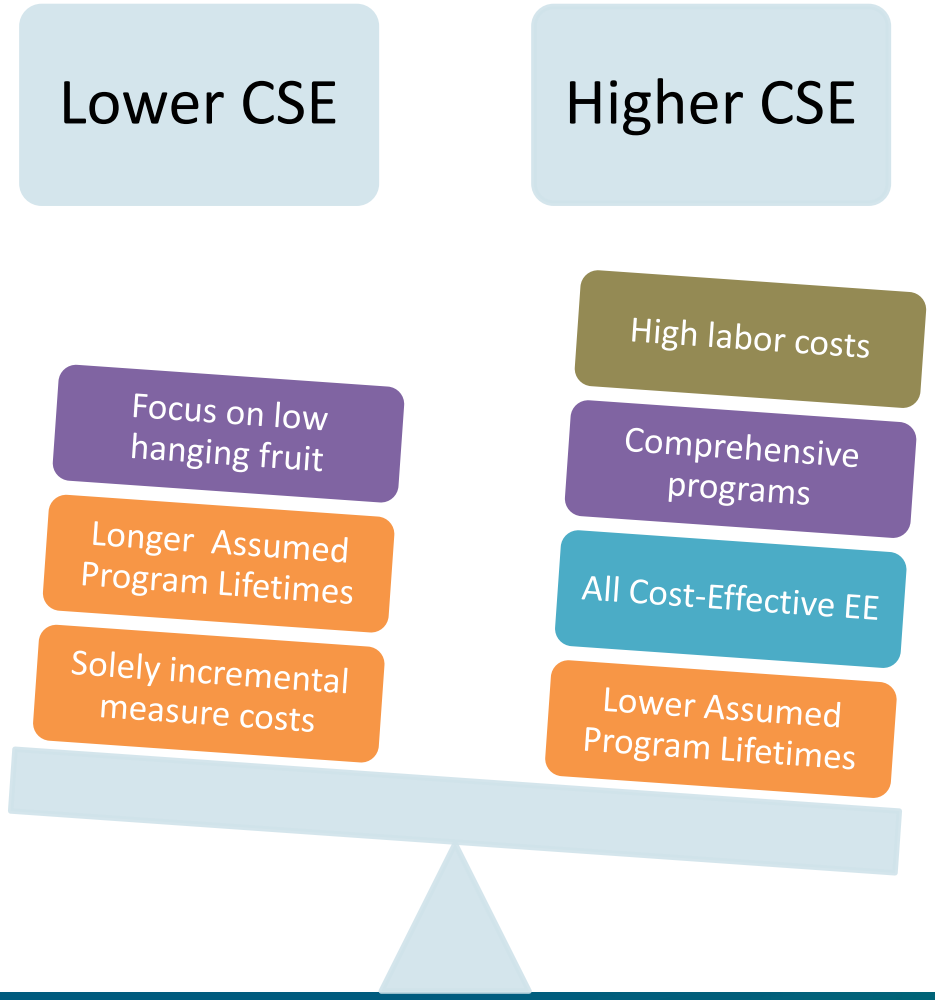
- Average values for **most C&I sector programs are $0.045-$0.06/kWh**, somewhat more costly than residential sector
- C&I programs garner **more participant investment** than residential programs



Source: LBNL DSM Program Database

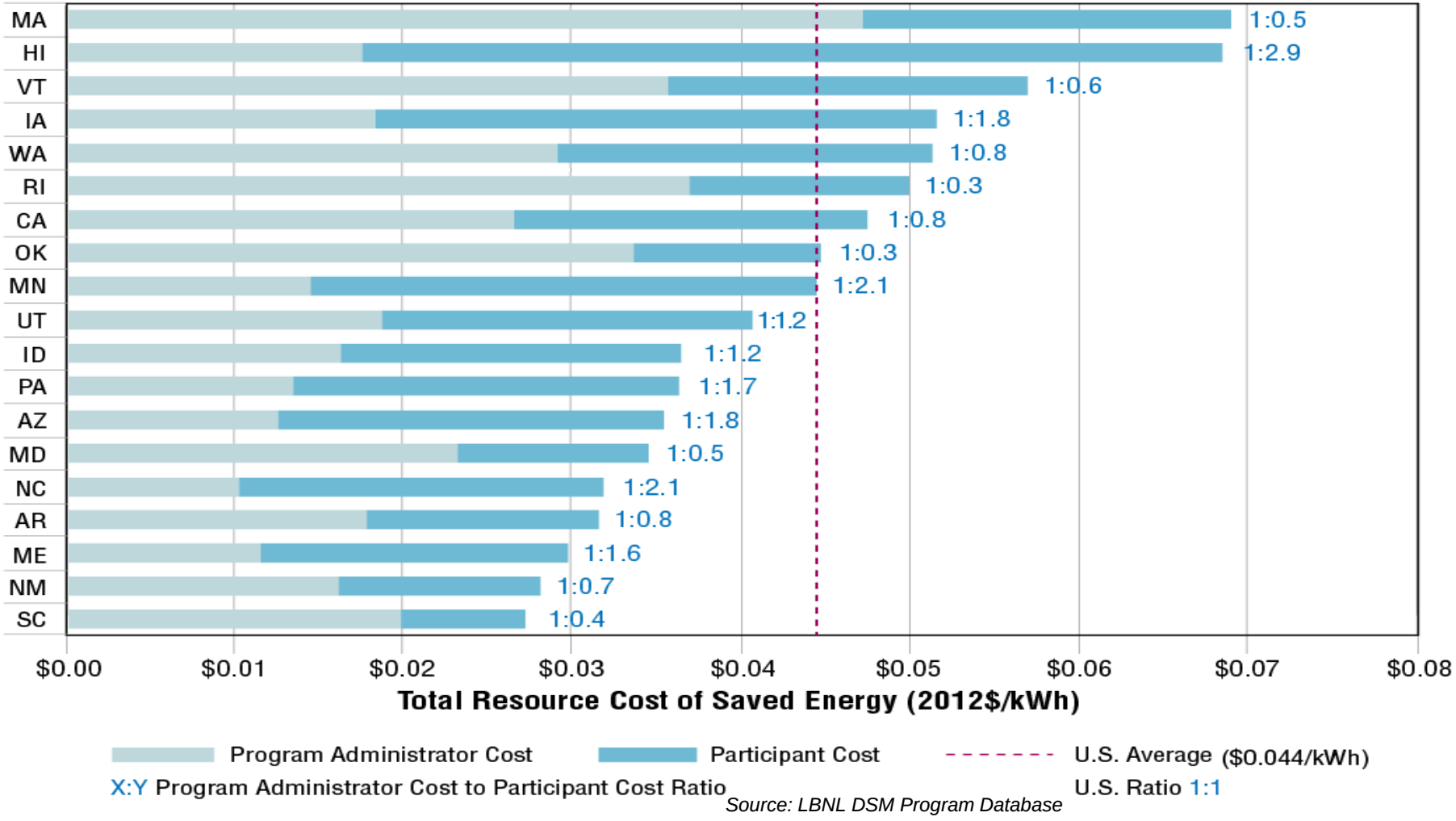
Factors That May Influence Total Resource CSE

CSE may vary across program administrator portfolios for reasons other than programmatic efficiency



Total Resource CSE by State

Large variability in the relationship of program costs to participant costs from state to state



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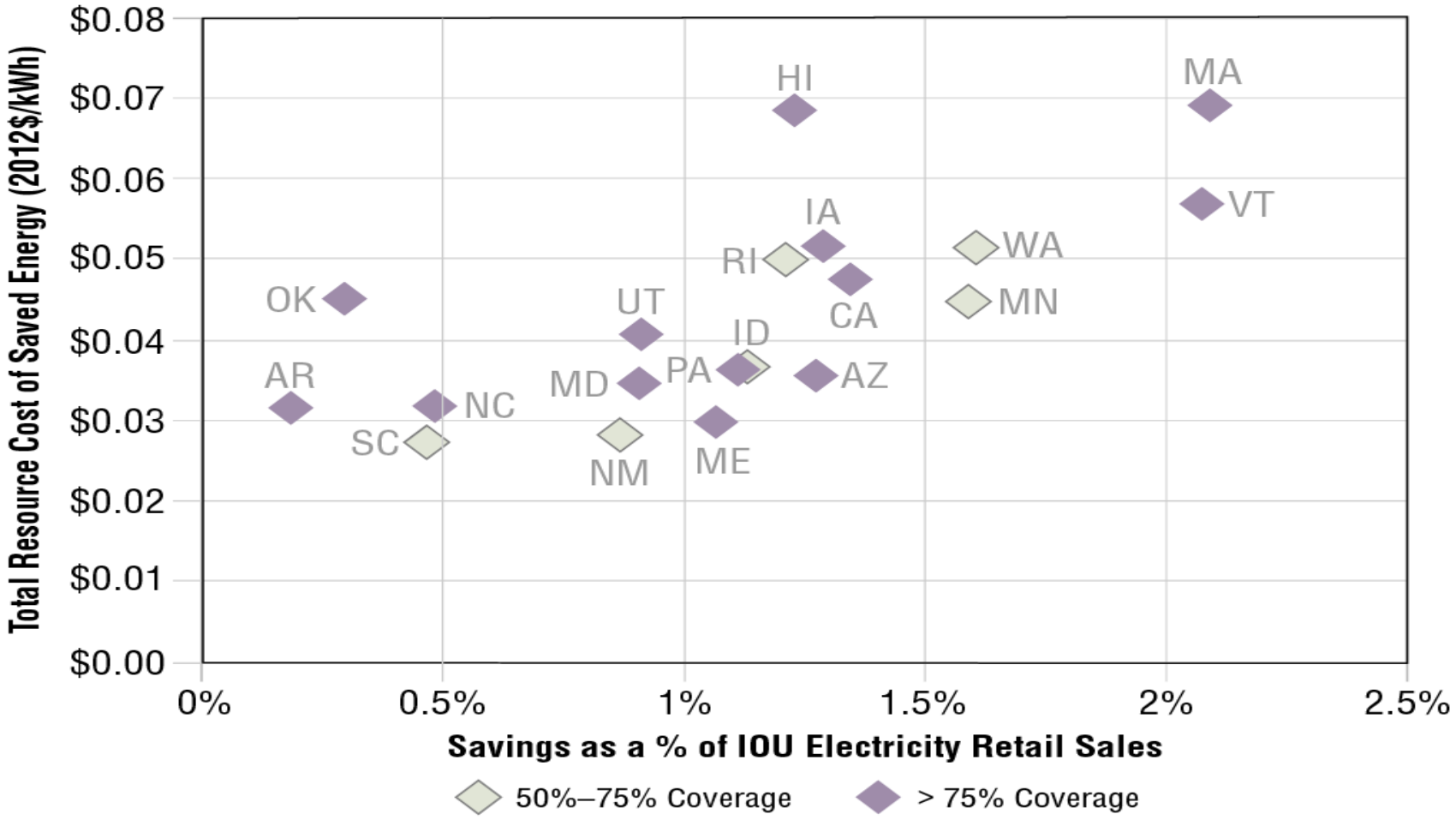
Total Resource CSE and Relative Savings by State

- Greater savings moves states up the efficiency supply curve
- Coverage is percent of IOU retail sales in each state



Sources: LBNL DSM Program Database & Energy Information Agency Form 861; MA Energy Efficiency Advisory Council

Why care about the cost of saved energy - and improved reporting

Regulators can use the cost of saved energy to:

- Weigh multiple energy demand and supply resource options
- Set or reassess EE Resource Standards
- Compare DSM program performance
- Assess integrated resource planning
- Assess options for compliance with environmental regulations

For others, better reporting is key for the same reasons, plus:

- Assessing confidence in efficiency as an investment (capital markets)
- Sizing up and better understanding the future of efficiency (researchers, industry actors)
- Developing business plans (contractors, ESCOs, retailers)
- Forecasting loads (resource planners)

Summary

- U.S. savings-weighted average total cost of saving energy: **$0.044/kWh**. Median: **$0.07/kWh**
- Residential programs had lowest TR CSE, influenced strongly by **lighting rebate programs**
- **Commercial & industrial programs** on average drew **greater participant investment**
- Many factors influence total resource CSE and relative administrator vs. participant cost contribution
- **Improved estimation and reporting of total costs helps satisfy regulatory needs and instills market confidence** in the efficiency resource

Thank You

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